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Contact discontinuities in solar wind

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Contact discontinuities (CD) are discontinuities that have magnetic fields linked between two sides but no plasma flows across its surface. Due to the lack of demonstrations of CD in observation, their stable existence is still under debate. Contact discontinuities are not expected to be observed in the solar wind because of the rapid diffusion of plasma along the magnetic fields across their surfaces. Nevertheless, hybrid simulations had demonstrated that stable CD can exist with a finite ratio of the electron temperature to ion temperature; but full particle simulations predicted that CD cannot persist in collisionless plasma as a result of electron thermal transport. On the other hand, electrostatic Vlasov simulations show that the structure of a contact discontinuity can be stable under a condition of out-of-phase profiles of the ion and electron temperatures. According to theoretical considerations, CD can survive in magnetodynamics plasma with constant total thermal pressure across the surface of CD, in ion-electron two-fluid plasma further with out-of-phase variations of the ion and electron thermal pressures, and in Vlasov theory with additionally out-of-phase variations of the ion and electron temperatures. In this study, we define the criteria for the selection of a CD event in observation, in accord with the jump conditions. CD events in the solar wind, with a constant total thermal pressure but different performances on the variations of thermal pressure and temperatures of ions and electrons will be demonstrated. The practical behavior of ion and electron temperature will be discussed in follow.